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EXAMINER	
PENNY, TABATHA L	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,036	PALOMARES GIL ET AL.	
	Examiner	Art Unit	
	TABATHA PENNY	1712	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 November 2010*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *75-125* is/are pending in the application.

4a) Of the above claim(s) *109-125* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *75-108* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Information Disclosure Statement

1. The listing of references in the specification is not a proper information disclosure statement. 37 CFR 1.98(b) requires a list of all patents, publications, or other information submitted for consideration by the Office, and MPEP § 609.04(a) states, "the list may not be incorporated into the specification but must be submitted in a separate paper." Therefore, unless the references have been cited by the examiner on form PTO-892, they have not been considered.

Claim Interpretation

2. Applicant has not provided a definition for the term non-hydrolysed. Applicant's specification teaches preparing a non-hydrolyzed precursor solution in a controlled environment containing less than about 10 ppm water (pg. 8 second para.). Based on this disclosure, one of ordinary skill in the art would understand the term non-hydrolysed, as used in applicants' specification, to mean a solution which is mostly unhydrolysed; however, one of ordinary skill in the art would also understand that as the environment in which the solution is prepared contains some amount of water, the non-hydrolysed solution must also contain some amount of hydrolysis of the moisture-sensitive metal alkoxides. Therefore, the broadest reasonable interpretation given to the term "non-hydrolysed" by the examiner when read in light of the specification will be: a solution which is mostly unhydrolysed and having only a portion of hydrolysis of the moisture-sensitive metal alkoxides.

Claim Rejections - 35 USC § 102

3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claim s 75-79, 82-84, 87-88, 99-105, and 108 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832). (Claim 87 evidenced by KSV (KSV Instruments Ltd., *What is a Quartz Crystal Microbalance,* Pharma Suppliers and News website))

Regarding applicants' Claim 75, 100-101, 103, and 105, ICHINOSE et al. discloses a low temperature fabrication method for fabricating conformal metal oxide coatings on a substrate (abstract and Fig. 1a) the method comprising the steps of : coating a surface of a substrate with a titanium alkoxide, i.e. a non-hydrolyzed precursor solution of one or more moisture sensitive metal alkoxides (abstract and 831 1st col. last para.) in an organic solvent (Table 1 footnote a) at a temperature of less than 150℃ (Table 1); and rinsing the precursor solution coated on the surface of the substrate in water to hydrolyze the precursor solution at the surface of the substrate and thereby form a conformal metal oxide coating on the substrate (Fig. 1 and col. 2) at a temperature of less than 150℃ (Table 1 and footnote b).

102: ICHINOSE et al. teaches that the frequency change over the period of twenty coating cycles gradually increased due to hydrolysis occurring in the solution by humidity in the air (pg. 832 second full para). This teaching of Ichinose et al. inherently supports the examiners position because the solution is non-hydrolyzed (at least for some period of time during the coating cycles) and begins to hydrolyze over several cycles from the humidity in the air.

103: In the alternative, ICHINOSE further teaches the effect of the hydrolysis is removed after the solution is renewed (pg. 832 second full para). This teaching of ICHINOSE et al. provides motivation for one of ordinary skill in the art to optimize the conditions in the environment such that hydrolysis from humidity does not occur (See MPEP 2144.05). It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to optimize the environment conditions the method of ICHINOSE et al., in order to avoid unwanted hydrolysis of the solution and prevent the necessity to renew the solution after several coating cycles, which is taught to be a disadvantage in the ICHINOSE reference.

Regarding applicants' Claim 76-77, ICHINOSE et al. discloses the metal alkoxide is titanium butoxide or aluminum butoxide or zirconium propoxide or nobium butoxide or tetramethyl orthosilicate (abstract).

Regarding applicants' Claim 78, ICHINOSE et al. discloses the step of coating the surface of the substrate is performed at 20℃ (Table 1), i.e. room temperature.

Regarding applicants' Claim 79, ICHINOSE et al. discloses the coating is by immersion, i.e. dipping the surface of the substrate, in metal alkoxide solution, i.e. in the precursor solution, for 3-10 minutes (col. 1 last para.-col. 2 ln. 1).

Regarding applicants' Claim 82 and 102, ICHINOSE et al. discloses the precursor solution has a concentration of less than 200 mM (Table 1).

Regarding applicants' Claim 83 and 104, ICHINOSE et al. discloses the step of rinsing the surface of the substrate is performed at 20°C (Table 1 and footnote b), i.e. room temperature.

Regarding applicants' Claim 84, ICHINOSE et al. discloses the step of rinsing is performed by immersion, i.e. dipping, in water.

Regarding applicants' Claim 87-88, ICHINOSE et al. discloses the surface is a gold-coated QCM resonator, i.e. a structured surface. Gold-coated QCM resonators are flat surfaces (KSV Figure); therefore, ICHINOSE et al. inherently discloses the surface is a flat surface.

Regarding applicants' Claim 99 and 108, ICHINOSE et al. discloses the thickness of the coating is 46 angstroms, i.e. 4.6 nm (pg. 832 2nd col. ln. 10).

6. Claim 80 is rejected under 35 U.S.C. 103(a) as being unpatentable over ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832) in view of BLOHOWIAK et al. (US 5,814,137).

Regarding applicants' Claim 80, ICHINOSE et al. discloses the step of coating is performed by immersion as discussed with regards to Claim 79. ICHINOSE et al. further discloses the coating solution is an aqueous sol (pg. 832 2nd col. last para.). ICHINOSE et al. does not appear to explicitly disclose the coating is performed by spraying.

However, BLOHOWAIK et al. discloses an aqueous sol can be applied to a substrate by dipping or spraying (abstract). The admission of BLOHOWAIK et al. that dipping and spraying are equivalent methods for applying an aqueous sol to the surface of a substrate presents a strong case of prima facie obviousness for substituting one for the other.

At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to substitute the dipping, of ICHINOSE et al. with spraying, as taught by BLOHOWAIK et al., because BLOHOWAIK et al. discloses they are both appropriate methods for applying an aqueous sol to the surface of a substrate.

7. Claim 81 is rejected under 35 U.S.C. 103(a) as being unpatentable over ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832) in view of ITSUKI et al. (US 2001/0050028).

Regarding applicants' Claim 81, ICHINOSE et al. discloses the step of coating is performed by immersion as discussed with regards to Claim 79. ICHINOSE et al. further discloses the coating solution is an aqueous sol (pg. 832 2nd col. last para.).

ICHINOSE et al. does not appear to explicitly disclose the coating is performed by spin coating.

However, ITSUKI et al. discloses sol-gel processes for the production of oxides, in which metal alkoxide solutions are applied to substrates by spin coating methods are known ([0005]). One of ordinary skill in the art would have had a reasonable expectation of predictably obtaining the metal oxide coating, of ITSUKI et al., by using the spin-coating deposition method, as taught by ITSUKI et al., because ITSUKI et al. discloses it is an appropriate method for depositing a metal alkoxide solution on the surface of a substrate.

At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to use the spin-coating, of ITSUKI et al., instead of the dipping in the method, of ICHINOSE et al., because ITSUKI et al. discloses spin coating is an appropriate method for depositing metal alkoxide solutions on the surface of a substrate.

8. Claims 85-86 and 106-107 are rejected under 35 U.S.C. 103(a) as being unpatentable over ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832) in view of PALOMARES et al. (Palomares et al., *Slow charge recombination in dye-sensitized solar cells (DSSC) using Al2O3 coated nanoporous TiO2 films,* Chem Communication, 2002, 1464-1465).

Regarding applicants' claim 85 and 106, ICHINOSE et al. discloses the features of claims 79 and 100 as disclosed above, but is silent as to the temperature used for drying the coating; therefore, one of ordinary skill in the art would have been motivated to look to the related art to determine an appropriate method for drying a hydrolyzed aluminum butoxide coating. PALOMARES et al. discloses drying the surface of the substrate at 120℃ (pg. 1464 2nd col. 3rd. para.).

At the time of the invention, it would have been *prima facie* obvious to one of ordinary skill in the art to modify the drying, of ICHINOSE et al., to include the temperature, of PALOMARES et al., because PALOMARES et al. discloses it is an appropriate temperature for drying a hydrolyzed aluminum butoxide coating.

Regarding applicants' claim 86 and 107, ICHINOSE et al. discloses drying a hydrolyzed aluminum butoxide coating with nitrogen gas (pg. 831 2nd col.); i.e. directing a gas flow there over.

9. Claims 75, 85, 88-91, 93-98, and 106 are rejected under 35 U.S.C. 103(a) as being unpatentable over PALOMARES et al. (Palomares et al., *Slow charge recombination in dye-sensitized solar cells (DSSC) using Al2O3 coated nanoporous TiO2 films,* Chem Communication, 2002, 1464-1465) in view of ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832).

Regarding applicants' claim 75, PALOMARES et al. discloses a low temperature method of fabricating a conformal Al2O3, i.e. metal oxide, coating on a

substrate (abstract and pg. 1464 2nd col. 3rd para.) the method comprising the steps of : coating the surface of the substrate with aluminum butoxide, i.e. a precursor solution of one or more moisture sensitive metal alkoxides, in isopropanol, i.e. in an organic solvent, at 60℃; and exposing the solution to water vapor, i.e. rinsing the precursor solution in water to hydrolyze the precursor solution at 120℃ (pg. 1464 2nd col. 3rd para.).

PALOMARES et al. does not appear to explicitly disclose coating the solution then rinsing the solution, which would result in hydrolysis of the coating on the surface of the substrate; however, ICHINOSE et al. discloses a low temperature fabrication method for fabricating conformal metal oxide coatings on a substrate (abstract and Fig. 1a) the method comprising the steps of : coating a surface of a substrate with a titanium alkoxide, i.e. a non-hydrolyzed precursor solution of one or more moisture sensitive metal alkoxides (abstract and 831 1st col. last para.) in an organic solvent (Table 1 footnote a) at a temperature of less than 150℃ (Table 1); and rinsing the precursor solution coated on the surface of the substrate in water to hydrolyze the precursor solution at the surface of the substrate and thereby form a conformal metal oxide coating on the substrate (Fig. 1 and col. 2) at a temperature of less than 150℃ (Table 1 and footnote b). ICHINOSE et al. discloses the metal alkoxide is titanium butoxide or aluminum butoxide or zirconium propoxide or nobium butoxide or tetramethyl orthosilicate (abstract).

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to modify the method of forming an aluminum butoxide

coating on a substrate to replace the hydrolyzing before coating, as taught by PALOMARES et al., with the hydrolyzing after coating, as is suggested by ICHINOSE et al., because ICHINOSE teaches it is a suitable method of forming an aluminum butoxide coating and one of ordinary skill in the art would have had a reasonable expectation of predictably obtaining the coated product of PALOMARES et al. by ICHINOSE's method.

Regarding applicants' claim 85 and 106, PALOMARES et al. discloses drying the surface of the substrate at 120℃ (pg. 1464 2nd col. 3rd. para.).

Regarding applicants' claim 88, PALOMARES et al. discloses surface is a fluorine doped conducting tin oxide glass with nanocrystalline TiO2 deposited thereon, i.e. a structured surface (pg. 1464 2nd col. second full para).

Regarding applicants' claim 89, PALOMARES et al. discloses a porous film of nanocrystalline titanium dioxide, i.e. the structure is a nanoporous surface (pg. 1464 2nd col. second full para).

Regarding applicants' claim 90, PALOMARES et al. discloses the surface is a nanocrystalline titanium dioxide, i.e. a reticulated surface (pg. 1464 2nd col. second full para).

Regarding applicants' Claim 91, PALOMARES et al. discloses the substrate is a fluorine doped conducting tin oxide glass with nanocrystalline TiO2 deposited thereon (pg. 1464 2nd col. 3rd para.). PALOMARES et al. does not appear to explicitly disclose the substrate includes a temperature sensitive-element; however, TiO2 sinters upon

heating. Therefore, PALOMARES et al. inherently discloses the substrate includes a temperature sensitive element.

Regarding applicants' Claim 93, PALOMARES et al. discloses the molecules are TiO2, i.e. inorganic (pg. 1464 2nd col. 3rd para.).

Regarding applicants' Claim 94, PALOMARES et al. discloses the substrate is coated with the TiO2, i.e. the molecules are at the surface of the substrate (pg. 1464 2nd col. 3rd para.).

Regarding applicants' Claims 95-96, PALOMARES et al. does not appear to explicitly disclose the coating extends over regions of the surface of the substrate not encompassed by the molecules and encapsulates the molecules.

However, where the claimed and prior art products are identical or substantially identical in structure or composition, or a re produced by identical or substantially identical processes, a prima facie case of obviousness has been established. In re Best, 195 USPQ 430, 433 (CCPA 1977). When the structure recited in the prior art is substantially identical to that of the claims, the claimed properties or function are presumed inherent. MPEP 2112. In this situation, the prior art exemplifies the applicants' claimed and disclosed method (see spec Example 2), so the claimed extension of the coating over regions of the surface of the substrate not encompassed by the molecules and encapsulation of the molecules by the coating are inherently present in the prior art. Absent an objective evidentiary showing to the contrary, the addition of the physical properties to the claim language fails to provide patentable distinction over the method of PALOMARES et al.

Regarding applicants' claim 97, PALOMARES et al. discloses the substrate comprises a porous film of nanocrystalline TiO2, i.e. the substrate comprises particles (pg. 1464 2nd col. second full para).

Regarding applicants' claim 98, PALOMARES et al. discloses the TiO2 is nanocrystalline, i.e. nanoparticles.

10. Claim 92 is rejected under 35 U.S.C. 103(a) as being unpatentable over PALOMARES et al. (Palomares et al., *Slow charge recombination in dye-sensitized solar cells (DSSC) using Al2O3 coated nanoporous TiO2 films,* Chem Communication, 2002, 1464-1465) in view of ICHINOSE et al. (Ichinose et al., *Stepwise Adsorption of Metal Alkoxides on Hydrolyzed Surfaces: A Surface Sol-Gel Process,* Chemistry Letters, 1996, 831-832) as applied to claims 75, 88-91, and 93-98 above, and further in view of SOMMELING et al. (Sommeling et al., *Flexible Dye-Sensitized Nanocrystalline TiO2 Solar Cells,* 2000, pg. 1-5).

Regarding applicants' Claim 92, PALOMARES et al. and ICHINOSE et al. disclose a method as discussed with regards to Claim 91. PALOMARES et al. does not appear to explicitly disclose the substrate includes a temperature sensitive element which is selected from the group consisting of a plastic and a polymer.

However, SOMMELING et al. discloses a polymer foil can be used for the substrate instead of glass in dye-sensitized solar cells (3.2). SOMMELING et al. further discloses the polymer foil is sensitive to temperatures and is coated by room temperature sputtering with indium tin oxide (3.2.1). The admission of SOMMELING et

al. that temperature sensitive polymer foils are equivalents to glass as the tin oxide coated substrate of a dye-sensitized solar cell presents a strong case of prima facie obviousness for substituting one for the other in the method of PALOMARES et al. and ICHINOSE et al.

At the time of the invention, it would have been *prima facie* obvious to on of ordinary skill in the art to use the temperature-sensitive polymer foil, of SOMMELING et al., instead of the glass substrate in the method of PALOMARES et al. and ICHINOSE et al., because SOMMELING et al. discloses it is an equivalent substrate for use in dye sensitized solar cells.

Response to Arguments

11. Applicant's arguments, see remarks, filed 11/24/2010, with respect to the 102 rejections under Palomares et al. have been fully considered and are persuasive. The 102 rejections of claims 75, 85, 88-91, 93-98, and 106 as anticipated by Palomares and the 103 rejections of claims 86 and 107 and claims 92-94 over Palomares et al. in view of Ichinose et al. and Palomares et al. in view of Sommeling et al. respectively have been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Palomares et al., Ichinose et al., and Sommeling et al.

12. Applicant's arguments filed 11/24/2010 concerning the Ichinose et al. reference have been fully considered but they are not persuasive. Applicant argues that Ichinose et al.'s solutions will be necessarily partially hydrolyzed because the preparation of the precursor solution is not under strictly-controlled water presence. In response to applicants' argument, applicant points to page 2 first full paragraph of Ichinose et al. for

support; however, this paragraph only further supports the examiners position that the solution of Ichinose is non-hydrolyzed. This paragraph teaches that the frequency change over the period of twenty coating cycles gradually increased due to hydrolysis occurring in the solution by humidity in the air. This teaching of Ichinose et al. supports the examiners position because the solution is non-hydrolyzed (at least for some period of time during the coating cycles) and begins to hydrolyze over several cycles from the humidity in the air. Ichinose further teaches the effect of the hydrolysis is removed after the solution is renewed, which at least suggest that one of ordinary skill in the art would want to control the environment to prevent hydrolysis of the solution. While the examiner notes the specification contains teachings of a controlled atmosphere, applicant has not claimed the strictly-controlled water presence, relied upon for this argument. In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the controlled atmosphere) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). Where the claimed and prior art products are produced by identical or substantially identical processes, a prima facie case of anticipation has been established, In re Best, 195 USPQ 430, 433 (CCPA 1977). With regard to the non-hydrolyzed limitation, when the structure recited in the prior art is substantially identical to that of the claims, the claimed properties or function are presumed inherent. MPEP 2112. In this situation, the prior art exemplifies the applicant's claimed method of

forming a non-hydrolyzed metal alkoxide solution, so the claimed properties, such as non-hydrolysis, relating to formed metal alkoxide solution are present in the prior art. Absent an objective evidentiary showing to the contrary, the addition of the physical properties to the claim language fail to provide patentable distinction over the prior art of record. Furthermore as "non-hydrolysed" is interpreted in the broadest reasonable interpretation, even if hydrolysis starts to occur immediately on formation of the solution, the solution of ICHINOSE remains "non-hydrolysed" for some period of time during the coating cycles as the initial solution is mostly unhydrolysed and the term "non-hydrolysed" as read in light of the specification allows for a small degree of hydrolysis to occur in the solution.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tennakone et al. (Tennakone et al., *Dye-sensitized composite semiconductor nanostructures,* Physica E, 2002, 190-196) and Wakayama et al. (US 6,194,650) cited as evidence to the inherency of the limitations in Claims 95-96.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TABATHA PENNY whose telephone number is (571)270-5512. The examiner can normally be reached on Monday thru Friday 8:00am-4:30pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on (571)272-1418. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/tp/

/Katherine A. Bareford/
Primary Examiner, Art Unit 1715